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Protecting the Ozone Shield: A New Public Policy

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Throughout the 1980's, public attention and concern have become increasingly focused on a number of specific environmental issues including the consequences of stratospheric ozone depletion caused by the release of CFC's and halons into the environment. This report discusses the public policy issues relating to the use of CFC's and halons and their long-term impact on the environment.

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INTRODUCTION

Throughout the 1980's, public attention and concern have become increasingly focused on a number of specific environmental issues including the consequences of stratospheric ozone depletion caused by the release of fully halogenated chlorofluorocarbons (CFCs) and halon into the environment. Stratospheric ozone protects the earth, and the life that dwells on it, from the sun's harmful ultraviolet radiation (UV_b). A prolonged increase in UV_b radiation exposure can cause suppression of the immune system and an increase in the incidence of skin cancer and cataracts in human beings. High levels of UV_b radiation can damage land and water based plant life including major food crops, and can cause an increase in smog formation, which has become a major problem in many urban areas. CFCs and halons can also prevent the release of radiant heat through the atmosphere and contribute to the pattern of global warming, commonly known as "the greenhouse effect."[1]

OVERVIEW OF THE OZONE DEPLETION PUBLIC POLICY ISSUE

In 1974, two atmospheric scientists, Molina and Rowland, presented a theory that chlorine from CFCs was destroying the protective ozone of the earth's stratosphere.[2] In 1978, as a result of a number of similar findings and wide-area news coverage, the United States banned CFCs used as propellants in "non-essential" aerosols.[1] In 1985, it was determined that chlorine and bromine from CFCs and halon were linked to the seasonal loss of ozone at the South Pole known as the Antarctic "ozone hole."[3] In 1987, news making measurements showed that 50% of the ozone over Antarctica was destroyed during the months of September and October.[3] During that same year, the United States joined twenty foreign nations in signing the Montreal Protocol on Substances that Deplete the Ozone Layer, which calls for phased reductions in the production of CFCs and a freeze in the production of halons. In 1988, the International Ozone Trends Panel reported that stratospheric ozone had declined an average of 2.5% over the past decade, not only seasonally in the Antarctic, but across the entire globe, even after accounting for natural variability.[3] On May 2, 1989 in Helsinki, Finland, 80 nations, including 48 countries that had ratified the Protocol, indicated they would favor banning the production of substances harmful to the ozone layer by the end of the century. These countries represented over 90 percent of the world's production of CFCs and halons. Thus, the use of CFCs and halons and their long term impact on the environment has become a true international public policy issue.

CFCs AND HALONs

CFCs and halons are an essential element of accepted daily life. The physical properties of CFCs (non-flammability, good

energy efficiency, low cost, and low toxicity) make them ideal for a wide variety of applications including use as refrigerants, foam-blowing agents, cleaning solvents, and sterilents. The use of CFCs is so widespread that the United States, alone, has over $135 billion in CFC-containing air conditioning and refrigeration equipment, ranging from car air conditioners and home refrigerators to large industrial HVAC systems.[4] Halons make an excellent fire extinguishing agent due to their excellent flame extinguishing ability, low toxicity, and lack of electrical conductivity, corrosivity and residue. Halons are used predominantly to protect computer rooms, or any other area where expensive electronic equipment is located, from fire damage.[5]

Thus, the public policy issues surrounding the reduction and/or elimination of CFCs and halons, and the search, selection and implementation of acceptable alternative materials, has been a continued source of discussion and controversy among the legislatures, manufacturer and user industries, environmentalists, and concerned citizens both here and abroad.

OZONE DEPLETION "PLAYERS"

Major producers of CFCs from the United States, Japan, Canada, Netherlands, France, United Kingdom, Germany, Italy, and Greece have acknowledged the damaging effects of fully halogenated fluorocarbons and halons. They are currently funding and/or supporting a variety of external research efforts at various universities, government laboratories, and private research organizations to more fully understand the causes and effects of ozone depleting chemicals. Specific areas of research include atmospheric modeling; ozone trend analysis; atmospheric measurements; kinetics and photochemistry of CFCs, halons, and ozone; climate modeling; UV flux calculations; and biological effects monitoring.[2] Additional internal research efforts at these companies have centered on identifying environmentally benign or less damaging material technologies that can replace the use of chlorofluorocarbons in refrigeration, industrial cleaning operations, and integrated circuit manufacturing.[6]

As international suppliers begin to phase out the production of CFCs and halon, user industries, such as the automotive industry, are subject to higher material costs from diminishing supplies, and must plan for major manufacturing changes based on substitute materials yet to be determined. The need to retool manufacturing facilities producing air conditioning systems, using uncertain substitute materials, has become a critical issue since many state legislatures have passed or introduced bills which outlaw the operation of cars with air conditioners that use CFCs, beginning with the 1993 model year.[3] This is an immediate and nationwide issue since almost 90% of the cars sold in the United States, both foreign and domestic, have air conditioners which use

ozone damaging CFCs.[3] It is estimated that CFCs are used in 90 million car and truck air conditioners, 100 million refrigerators, 45 million home and building air conditioners, and 30 million freezers across the country.[7] The potential loss of the daily benefits of refrigeration, which almost everyone takes for granted, will certainly be a forefront, national public issue in the immediate future. People will expect the government and industry to protect and preserve the environment, while simultaneously maintaining the accepted availability and functionality of consumer goods which presently use ozone depleting materials.

While the phaseout of CFCs is posing a potential problem for the consumer market, the essential use of halons by the Department of Defense represents another major public policy issue. DOD procured almost 35% of the 1986 U.S. production of Halon 1211, a common fire extinguishing agent.[1] This material is an essential part of fire suppression in the crew compartments of tactical vehicles, aircraft, shipboard systems, and in command, control and communication centers. Halon 1211 is an especially important fire extinguishing agent for the Army in tactical vehicles, such as tanks, where crews cannot be evacuated during combat situations if a fire starts.

The CFC and halon market provided by DOD affects the business practices of civilian producers of fire protection systems, refrigeration systems, cleaning agents, medical sterilizing systems, and propellants. Manufacturers produce these materials to meet military specifications. Many companies cannot afford to maintain both military and consumer manufacturing processes. Therefore, one production line serves both marketplaces. It is conceivable that the continued non-essential use of ozone-damaging CFCs and halons is being perpetuated in the civilian sector by military requirements. Therefore, DOD, in cooperation with EPA and industry, is taking action to reduce military use of halons and CFCs.[8] While private industry is seeking alternative substitute materials, DOD is sponsoring innovations and technology advancement, such as tighter containment systems which reduce refrigerant leakage, that can positively impact on the civilian sector in reducing the amount of ozone-damaging halons and CFCs released into the environment.[1]

<u>CFC AND HALON ALTERNATIVES</u>

There are a variety of alternatives proposed to fill the gap caused by the CFC and halon production phaseout. DuPont, the world's largest producer of CFCs, has predicted that the demand for CFCs and halon in the year 2000 will be met in four ways. About thirty percent will be replaced by hydrochlorofluorocarbons (HCFCs), a class of non-fully halogenated chlorine-containing CFCs which have a much lower ozone depleting potential than normal

CFCs.[3] Hydrofluorocarbons (HFCs), which do not contain the ozone destroying chlorine molecule, will replace nine percent of the demand.[1] But many existing industrial cooling systems, which have a serviceable life of up to 40 years, will not be able to use these substitute materials. DuPont's solution to this problem will be a recycling program to stretch existing supplies as CFC production is cut. Over time, CFCs become less effective refrigerants as they are contaminated by lubricating oil and other substances. DuPont plans to buy back these contaminated, common refrigerants and reprocess them using several distillation methods. The reclaimed material will be sold back to outside customers as declines in new CFC production pinch market supplies.[4] Finally, DuPont predicts that approximately thirty percent of the market will be replaced by non-fluorocarbon alternatives, such as ammonia for refrigeration, and aqueous or terpene cleaners in electronics.[1]

ALTERNATIVE PATH RISK MANAGEMENT

But not all these alternative paths are without risk. One possible danger to recycling CFCs is that people may try to slip hazardous materials, such as polychlorinated biphenyls (PCBs), into the old refrigerant.[4] Therefore, all reclaimed CFCs will have to be tested for such materials and the cost for testing will probably be passed onto the consumer. If contamination is detected, the reclaimed CFC batch will have to be incinerated, again adding to the overall recycling operation cost. Some proposed non-fluorocarbon alternative materials have hazardous characteristics not found in the original CFC materials. Ammonia is both poisonous and corrosive, and terpene compounds are very flammable.[9] The use of hazardous materials in equipment serviced by novice operators, such as the everyday homeowner, represents a recognizable risk. The legislature must perform a risk management assessment and a cost/benefit analysis on these hazards before beginning a substitution implementation plan.

In addition to environmental and health risks, there will also be risks assumed by industry. Companies will have to expend large amounts of capital to construct new manufacturing facilities which can produce CFC replacement materials. DuPont plans to spend over $1 billion in new plants to make HCFCs, but has publicly expressed serious concerns since many environmental groups recommend that HCFCs, which also deplete the ozone layer, should be identified for early phaseout along with CFCs and halons. DuPont is looking for government assurances that HCFCs will not be prematurely regulated since they must be able to sell HCFCs for at least 20 years to earn an adequate return on their investment.[4] Companies that must alter production lines to use substitute products or alternative technologies will also assume similar financial risks.

CONCLUSION

The pressure to immediately eliminate all ozone depleting materials is mounting since the thinning of ozone levels measured today is the result of CFC emissions which occurred in previous decades. It takes several years for CFCs released at the earth's surface to travel to the upper stratosphere where their chlorine decomposition byproducts begin destroying protective ozone molecules.[5] Each CFC molecule, which reaches the stratosphere and decomposes, has the potential to destroy about 100,000 ozone molecules over a century old lifetime.[10] In 1988, over 254 million pounds of ozone depleting chemicals were released into the environment.[11] The multiplication of this huge amount of released material by a lifetime factor of 100,000 has caused many environmentalists to argue that the phaseout of CFCs by the year 2000 is not soon enough to protect the earth and its inhabitants from the harmful effects of increased UV_b radiation and global warming.

Another dilemma surrounds this public policy issue since the first solutions available may not be the best alternatives. Both the EPA and Congress support a policy position which would promote an orderly transition in the marketplace using the best CFC and halon alternative materials which have the most favorable long term benefits for the environment, economy, and society. The Clean Air Act of 1990 calls for all CFCs and carbon tetrachloride, another ozone depleting chemical, to be phased out through the 1990's and outlawed by January 1, 2000. HCFCs, one of the major CFC alternatives proposed by DuPont, will be outlawed for aerosol cans and insulating materials by January 1, 1994, and production will end by the year 2030.[12] Through this legislation, the Congress and President Bush have attempted to take a firm position on preserving the protective ozone layer while insuring the availability of consumer goods demanded by the public and minimizing the financial risks to domestic suppliers and manufacturers.

But are the time frames proposed under this domestic public policy the correct milestones required to insure the survival of an adequate protective ozone layer and avert the trends of global warming? In order for this policy to succeed, must all foreign producers and consumers of ozone depleting materials follow the guidelines set forth by the United States? Only analysis of the future incidence of skin cancer and cataracts in human beings, yields of world foodstuffs harvested, average global temperatures, and levels of stratospheric ozone in the forthcoming decades will give a true answer to these questions and determine the success or failure of this environmental public policy.

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